

14.7

8. Critical point is  $(0,0)$ , since  $D(0,0) = -1 < 0$ ,  $(0,0)$  is a saddle point.

16. Critical points are  $(0,0)$ ,  $(1, \pm 1)$  and  $(-1, \pm 1)$

-  $(0,0)$  is a saddle point

-  $(1,1)$  and  $(-1,-1)$  are local maxima

-  $(1,-1)$  and  $(-1,1)$  are local minima

44. The distance from the origin to a point  $(x,y,z)$  on the surface is

$$d = \sqrt{x^2 + y^2 + z^2}, \text{ where } y^2 = 9 + xz, \text{ in}$$

this case it is easier to write  $f$  as a function of  $x$  and  $z$

so

$$d = \sqrt{x^2 + (9 + xz) + z^2}.$$

It is easier to minimize  $d^2 = x^2 + (9 + xz) + z^2$  because

the critical pts of  $d$  and  $d^2$  will occur @ the same point so

you should get  $(0,0)$  a minimum critical point.

→ This means that  $(0, \pm 3, 0)$  are the closest points to the origin.